The opinion in support of the decision being entered today was ***not*** written for publication and is ***not*** binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte STEVEN HURWITT

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Appeal No. 2001-2455
Application No. 08/439,490

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ON BRIEF

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Before WARREN, WALTZ, and POTEATE, ***Administrative Patent Judges***.

POTEATE, ***Administrative Patent Judge***.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's refusal to allow claims 1-41, which are all of the claims pending in the application.

Claims 1, 14, 16, 26, 40 and 41 are representative of the subject matter on appeal and are reproduced below:

1. A replaceable sputtering target comprising:

a circular target unit that is formed at least in part of a volume of sputtering material, the unit having a forward facing front sputtering face of the sputtering material and a rearward facing rear face having a water impermeable cooling surface lying in an annular area thereon around a center;

a recessed peripheral rim having:

a forward facing annular front edge having a vacuum-sealing surface thereon surrounding the front sputtering face, the front edge being spaced rearwardly of the forward face of the target unit, and

a rearward facing annular rear edge having an outer water-sealing surface thereon surrounding the rear face of the target unit;

tension maintaining support structure fixed at the center on the rear face, and

the rear face having an annular inner water-sealing surface thereon surrounding the tension maintaining support structure.

14. A removable sputtering target assembly comprising:

a replaceable target unit formed at least in part of a volume of sputtering material, the unit having a forward facing front sputtering face of the sputtering material and a rearward facing rear face having a water impermeable cooling surface lying in an area thereon;

the target unit having a forward facing front peripheral edge having a vacuum-seal surface thereon surrounding

the front sputtering face and a rearward facing rear edge having a water-seal surface thereon surrounding the rear face of the unit; and

a cooling jacket connected to the back of the target unit and having a forward facing peripheral edge having a water-seal surface thereon in water sealing engagement with the water-sealing surface on the rearward facing edge of the target unit so as to enclose a cooling water cavity between the cooling jacket and the cooling surface, the cooling jacket having cooling water ports therein communicating with the cooling water cavity.

16. A sputtering cathode assembly comprising:

a housing;

a plasma shaping and confining magnet assembly carried by the housing;

a target assembly removably connected to the housing, the target assembly including:

a replaceable target unit having a back and formed at least in part of a volume of sputtering material having a front sputtering face thereon, and

a cooling jacket connected in water-sealing relationship to the back of the target unit to enclose a cooling water cavity between the cooling jacket and the target unit, the cooling jacket having cooling water ports therein communicating with the cooling water cavity, the target unit having a rear face positioned to be in direct cooling contact with flowing cooling water within the cavity, the cooling jacket configured to protectively isolate the magnet assembly from cooling water in the cavity; and

a supply of flowing cooling water detachably connectable to the cooling water ports upon the removable connection of the target assembly to the housing.

26. A sputtering apparatus comprising:

a vacuum chamber surrounded by a chamber wall and having a substrate support mounted therein;

a sputtering cathode assembly mounted in an opening in the chamber wall, the cathode assembly including a housing, a plasma shaping and confining magnet assembly carried by the housing, and a target assembly removably connected to the housing;

the target assembly including:

a replaceable target unit having a back and formed at least in part of a volume of sputtering material having a front sputtering face thereon, and

a cooling jacket connected in water-sealing relationship to the back of the target unit to enclose a cooling water cavity between the cooling jacket and the target unit, the target unit having a rear face positioned to be in direct cooling contact with flowing cooling water within the cavity, the cooling jacket being removable with the target from the cathode assembly;

an electrical insulator between the cathode assembly and the chamber wall around the opening and surrounding the sputtering face of the target; and

a power supply having a negative output connected to the cathode assembly and a positive output connected at least indirectly to the chamber wall.

40. A replaceable sputtering target for use in a sputtering apparatus having a vacuum chamber surrounded by a chamber wall and having a substrate support mounted therein, a sputtering cathode assembly mounted in an opening in the chamber wall, the cathode assembly including a housing, a plasma shaping and confining magnet assembly carried by the housing, and a

target assembly removably connected to the housing where the target assembly includes a cooling jacket connected in water-sealing relationship to the back of a target to enclose a cooling water cavity between the cooling jacket and the target and removable with the target from the cathode assembly, an electrical insulator between the cathode assembly and the chamber wall around the opening and surrounding the sputtering face of the target; and a power supply having a negative output connected to the cathode assembly and a positive output connected at least indirectly to the chamber wall, the target comprising:

a circular target unit that is formed at least in part of a volume of sputtering material, the unit having a forward facing front sputtering face of the sputtering material and a rearward facing rear face having a water impermeable cooling surface lying in an annular area thereon around a center, the rear face being configured to form a boundary of the cavity in direct contact with cooling fluid in the cavity when the target unit is connected to a cooling jacket;

a forward facing front edge having a vacuum-sealing surface thereon bordering the front sputtering face to form a vacuum seal when the target is connected in the apparatus; and

a rearward facing rear edge having a water-sealing surface thereon bordering the rear face of the target unit to seal the cavity when the target is connected to the cooling jacket.[1]

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[1]The version of claim 40 included in the Appendix to appellant's brief is incorrect. Claim 40 was originally added by appellant's amendment filed June 23, 1997, Paper No. 5. Thereafter, an amendment after final rejection was filed December 5, 1997, Paper No. 7 in which appellant requested that the word "back" in claim 40, line 26 be changed to "rear". The examiner indicated that this amendment would be entered upon the filing of an appeal. See Advisory Action, Paper No. 8, mailed December 17, 1997. The amendment has not been made to claim 40 as the word "back" could not be found. Thus, the current version of claim 40 is the claim as originally presented in Paper No. 5.

41. A method of replacing a sputtering target in a sputtering apparatus comprising the steps of:

disconnecting a used target from the cathode assembly of the apparatus by removing the used target with a cooling jacket containing a cooling fluid cavity attached to the back of the target with the back face of the used target forming a surface of the cavity;

then, separating the used target from the cooling jacket, replacing the used target with a new target, connecting

the new target to the cooling jacket with the cooling fluid cavity in contact with the back face of the new target;

then, connecting the new target to the cathode assembly of the apparatus.

The references relied upon by the examiner are:

Urbanek et al. (Urbanek)	3,741,886	June 26, 1973
Landau	4,407,708	Oct. 4, 1983
Henderson et al. (Henderson)	5,240,580	Aug. 31, 1993
Demaray et al. (Demaray)	5,252,194	Oct. 12, 1993
Kerschbaumer	5,259,894	Dec. 14, 1993
Schuhmacher et al. (Schuhmacher)	5,421,978	June 6, 1995
		(filed Dec. 28, 1993)

GROUNDS OF REJECTION

1. Claims 1-26 and 29-41 stand rejected under

35 U.S.C. § 103 as unpatentable over Landau in view of Urbanek

and Demaray.

2. Claims 1-26 and 29-41 stand rejected under

35 U.S.C. § 103 as unpatentable over Schuhmacher in view of Urbanek or Demaray.

3. Claims 1-26 and 29-41 stand rejected under 35 U.S.C. § 103 as unpatentable over Kerschbaumer in view of Urbanek and Demaray.

4. Claims 27 and 28 stand rejected under 35 U.S.C. § 103 as unpatentable over Landau in view of Urbanek, Demaray and Henderson.

5. Claims 27 and 28 stand rejected under 35 U.S.C. § 103 as unpatentable over Schuhmacher in view of Urbanek, Demaray and Henderson.

6. Claims 27 and 28 stand rejected under 35 U.S.C. § 103 as unpatentable over Kerschbaumer in view of Urbanek, Demaray and Henderson.

We reverse as to all six grounds of rejection.

BACKGROUND

The invention relates to sputter coating for use in the application of thin films to substrates in the manufacture of semiconductor wafers. Appeal Brief, Paper No. 15, received July 27, 1998, page 2. During a sputtering process, heat is

generated necessitating the cooling of the sputtering target. ***Id.***, page 3. Cooling is usually accomplished by circulating fluids to conduct heat from the target, the circulating fluids usually being in thermal contact with the back of the target. ***Id.*** "The present invention provides . . . [a] target assembly that includes a replaceable target and a cooling jacket, with the target assembly being removable from the cathode assembly of the sputter coating machine with the target and cooling jacket still assembled." ***Id.***

DISCUSSION

The initial burden of presenting a ***prima facie*** case of obviousness rests on the examiner. ***In re Oetiker***, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). In order to establish a ***prima facie*** case of obviousness, the examiner must identify a suggestion or motivation to modify the teachings of the cited references to achieve the claimed invention. ***In re Kotzab***, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000). "[A] rejection cannot be predicated on the mere identification . . . of individual components of claimed

limitations." ***Ecolochem, Inc. v. Southern Cal. Edison Co.***, 227 F.3d 1361, 1375, 56 USPQ2d 1065, 1076 (Fed. Cir. 2000) (***quoting Kotzab***, 217 F.3d at 1371, 55 USPQ2d at 1317).

The examiner maintains that each of the primary references, Landau, Schuhmacher and Kerschbaumer, disclose the invention as claimed in claims 1-26 and 29-41 with the exception that "direct cooling is not discussed and a tension supporting structure in the center is not discussed." Examiner's Answer, Paper No. 16, mailed October 8, 1998, page 4. The examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the primary references to include the tension support structure of Urbanek. ***Id.*** (referencing figure 2 of Urbanek).[2]

Claims 27 and 28 include the additional limitation of a shield. It is the examiner's position that it would have been obvious to one of ordinary skill in the art at the time of the invention to have used Henderson's shielding means to shield the peripheral portion of the target of the primary references

[2]Demaray teaches rotating magnetic means and is relied on for a showing of moveable magnets recited in various dependent claims. Examiner's Answer, page 4.

"since shielding is well known in the art to protect other parts of the apparatus from contamination." ***Id.***, page 5.

For the reasons set forth below, we find that the examiner has failed to establish a teaching or suggestion for each of the recited claim elements and, therefore, has failed to establish a ***prima facie*** case of obviousness. We focus our discussion of the rejections on each of the independent claims.

Claim 1

Claim 1 is directed to a replaceable sputtering target which includes a recessed peripheral rim. The rim includes a tension maintaining support structure fixed at the center of the rear face, the rear face having an annular inner water-sealing surface thereon surrounding the tension maintaining support structure. Claim 1. The examiner concedes that the primary references do not discuss a center tension supporting structure. Examiner's Answer, page 4. However, the examiner maintains that "Urbanek in figure 2 clearly shows a tension supporting structure is an integral part of the target or detachably connected." ***Id.*** While this may be true, the examiner has failed to offer any explanation as to why one of ordinary skill in the art would have

been motivated to have employed Urbanek's tension maintaining support structure in the apparatuses of the primary references. ***See Kotzab***, 217 F.3d at 1371, 55 USPQ2d at 1317 ("[P]articular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected the[] components for combination in the manner claimed.").

The Federal Circuit requires that the Board set forth its findings and the grounds thereof ***as supported by the agency record***, and explain its application of the law to the found facts. ***In re Lee***, 277 F.3d 1338, 1344, 61 USPQ2d 1430, 1433-34 (Fed. Cir. 2002). In the present case, the record is simply devoid of any findings by the examiner as to why one of ordinary skill in the art would have been motivated to have utilized Urbanek's tension supporting structure in the apparatuses of the primary references.

Claim 14

Claim 14 is directed to a "removable" sputtering target assembly which comprises both a replaceable target unit and a cooling jacket connected to the back of the target unit. Landau discloses a sputtering apparatus wherein the target is removable. See, e.g., claim 1. However, there is no indication that a

cooling jacket, connected to the back thereof, is also removable. Schuhmacher discloses an apparatus wherein the cooling channel is positioned between a diaphragm and the base. The target is connected to the base by means which are separate from the means for connecting the diaphragm to the base. See column 3, lines 34-39. Thus, while it is indicated that the target is removable, there is no indication that an assembly comprising both the target and cooling jacket are removable as required by claim 14. Likewise, there is no disclosure or suggestion in Kerschbaumer of a removable assembly comprising the target unit and cooling jacket.

Claims 16 and 26

Claim 16 is directed to a sputtering cathode assembly and claim 26 is directed to a sputtering apparatus which includes a sputtering cathode assembly. The sputtering cathode assemblies of claims 16 and 26 include target assemblies removably connected to a housing, the assemblies including a replaceable target and a cooling jacket. For the reasons set forth above with respect to claim 14, the cited references fail to disclose or suggest apparatuses wherein the target unit ***and*** cooling jacket are removable.

Claim 40

Claim 40 recites a replaceable sputtering target which comprises a circular target unit and recessed peripheral rim including a tension maintaining support structure fixed at the center of the rear face thereof, the rear face having an annular inner water-sealing surface thereon surrounding the tension maintaining support structure. For the reasons set forth above in connection with Claim 1, the examiner has failed to establish why one of ordinary skill in the art would have been motivated to have modified the primary references in light of the teachings of the secondary references to achieve these claimed features.

Claim 41

Claim 41 is directed to a method of replacing a sputtering target in a sputtering apparatus which includes the step of disconnecting a used target from the cathode assembly of the apparatus by removing the used target ***with*** a cooling jacket. As discussed above, none of the cited references disclose or suggest an apparatus wherein the cooling jacket is removable along with the target.

In view of the foregoing, we find that the examiner has failed to establish a ***prima facie*** case of obviousness with respect to claims 1-41. The rejections are reversed.

REVERSED

CHARLES F. WARREN Administrative Patent Judge	)
THOMAS A. WALTZ Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
LINDA R. POTEATE Administrative Patent Judge	)

LRP:psb

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